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FOREST INSECT CONTROL

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Prevention of insect outbreaks and the losses they cause is the goal of entomological research. Large-scale aerial suppressive applications of insecticides to control forest insects are spectacular. They are also costly. Losses, however, may be greater if control is not applied and may be reflected by reduced increment, the presence of dead and dying trees, and increased hazards from fire and disease. The latter are more insidious--less readily measured--but are none the less real. The aim of forest insect research is to reduce these costs and losses. This calls for better methods of detection, better understanding of the causes underlying the origin of epidemic outbreaks, and of the factors responsible for their evolution and decline. The part played by natural control which includes climate, diseases of insects, and insect parasites and predators needs to be understood because these may be vital factors in the evaluation of the potential of an infestation.

Of course, there is a lot that is already known about forest insects and their control. For a good many years entomologists have been busy cataloging the species of borers, bark beetles, and defoliators that occur on trees throughout the country. They have been observing and

intensively studying them in many types of stands and under a diversity of conditions. As a result, most of the species of real economic importance are readily recognized. For most of them also details of life history, habits, food preferences, and their distribution are pretty well known. To be sure, occasionally we are faced with the appearance in outbreak form of a species hitherto regarded as harmless but this is the exception. For most of them suppressive measures have been developed that will cope with epidemics if they are promptly and thoroughly applied.

The discovery of DDT and its formulation into insecticides plus the development of effective distributing apparatus for use on airplanes has made it possible to control defoliator outbreaks in widespread forested areas that were wholly inaccessible for control purposes only a few years ago. On an area basis the cost of these operations does not run much above a dollar an acre. Means are available for controlling bark beetles also. Here, because of the wide assortment of species involved and the variations in bark thickness and heights of infested trees, several different control techniques have been evolved. It has not been possible to adapt airplane spraying to their control. Each individual infested tree has to be treated as a unit. However, recent research has shown that reductions in cost in controlling some of these insects are possible; certain species in certain trees having been found susceptible to bark-penetrating sprays applied while the trees are still standing. In the west still another way to control certain bark beetles is under investigation and has been found applicable to a limited extent. For instance,

in the east side ponderosa pine stands of Oregon and northeastern California it has been found possible to lessen the intensity of, if not to prevent altogether, the development of epidemics of the western pine beetle by selectively removing from the stand in salvage operations trees that are attractive to, or susceptible to, attacks by the beetle. How widely applicable this control method is to this species on ponderosa pine in other portions of the West or to other insects on other tree species is not known.

Research, therefore, has furnished a working knowledge of the control of many of the important forest insect pests. But there is much more that it can give us. It is still a costly business to control the spruce budworm on hundreds of thousands of acres, some of which are in extremely rugged terrain. We have yet to determine on a working basis the absolute minimum dosage that should be applied to give satisfactory control. We need to know the degree of atomization of the spray to give the widest possible swath; we need to know how high we can fly above the forest crown while liberating the spray and still get good control. It is easy to see that if insecticide formulations can be developed to permit a lower dosage and a finer atomization that will permit fewer flight runs, the cost of control on a job of the magnitude of the spruce budworm project will be greatly lessened. From a safety standpoint, the spray should be liberated as high above the tree tops as possible.

It is believed that in the field of preventive entomology, however, research offers the greatest promise for the future. But there is much

to learn before prevention can replace direct control. For instance, what are the causes underlying insect outbreaks? How may an outbreak be detected in its incipiency before it has grown and spread over wide areas? What are the factors responsible for the evolution and decline of outbreaks? Why do certain outbreaks fade out and disappear in their early stages, while others continue for years until billions of board feet of timber are destroyed? How may different kinds of outbreaks be identified early enough to prevent the needless suppression of those on their way out through natural causes? How may forests be developed that are most resistant to insect epidemics? These are some of the questions that must be answered before the day preventive entomology really arrives. It will take time and it may require a lot of research to provide the answers.

Management wants forest pest control now to protect the stands which it expects to harvest. Yet all of us are fully conscious of the probable needs of the future. Protection of the forest resources cannot always be dependent on present methods. It may be that cheaper methods of control will be needed or that more effective measures will be required. One thing seems certain and that is that forest insect problems in the future will demand control measures not now available. This seems to lead to the conclusion that we must push research now to give management today the best tools that can be made available and at the same time pursue the more basic and long-term studies to the end that we may look forward with confidence to the successful safeguarding of the forests in

the years to come. This point of view throws a heavy load on research agencies. Funds now available cannot be stretched to meet this double load. The Bureau of Entomology and Plant Quarantine is keenly aware of this need.

I have heard it said that the study of forest insects is in something of the position of a stepchild in the Bureau. It has been said that we are more interested in insects attacking agricultural crops than in those that cause damage to forests. A look at the record shows that of the 10 divisions of the Bureau engaged in research, 12 percent of this years' total appropriation for research has been allocated to the Division of Forest Insect Investigations. The most that any division receives for research is only slightly over 14 percent. Necessarily most of the divisions receive less than Forest Insects. Neither does this mean that we are discriminating against agricultural problems. It frequently happens that pests of annual crops have more broods per season than many forest insects have. Research may move faster when the work is closer at hand and there is ample material to work with. The gravity of the forest insect problem is appreciated as is evidenced by the consistent and sustained support given this work from available funds.

On the other hand the status of forest insect control at the present time is not altogether unsatisfactory. There are measures to alleviate conditions when infestations threaten. Consider the spruce budworm problem. Progress has been made in its control. Areas of heavy infestation in which danger of tree killing is imminent have been

drastically reduced in the past couple of years. Or consider the Engelmann spruce beetle in Colorado. During the past two years well over a million infested trees have been individually sprayed; and this work, in conjunction with heavy mortality of broods as a result of low temperatures last winter and the control effected by woodpeckers, appears to have broken the back of the epidemic. These are the two big, spectacular control jobs--many smaller, lesser known ones could be mentioned also to show that forest insect outbreaks can be, and are being, suppressed.

In still another way the picture of forest insect control is brighter now than ever before. The passage of the Forest Pest Control Act by the 80th Congress made possible the establishment of a detection service that bids fair to make the sudden and unexpected appearance of forest insect outbreaks a thing of the past. This Act contemplates the cooperation of Federal, State, and other public agencies, as well as private timberland owners, in detecting and reporting the presence of infestations. It goes even farther in providing for the examination of threatening infestations to determine needs for control by technically trained entomologists; it provides for technical assistance by the Bureau in conducting control programs, and for post-control check-ups to determine the results of control operations. This program is now under way. The response of timber owners has been well demonstrated in spruce budworm surveys in Washington and Oregon. Without the active interest and cooperation of the many agencies and individuals in this program it could not have progressed as it has.

The survey program is well on its way but we cannot lessen efforts to strengthen and perfect it. More men and more stations, strategically located over the country, are needed to provide the type of coverage required to safeguard the national interest in the forest industry. Schools at Fort Collins and New Haven have been held where survey leaders have met, compared notes, and studied the most effective and economical methods of conducting surveys with the funds and personnel available. They have held detection schools in Washington, Oregon, and California where individuals representing many private timberland owners and other land-managing agencies have been aided in the use of methods to detect and report forest insect conditions. Studies with the airplane are being continued to learn to utilize its full value as a tool in locating outbreaks.

When insect infestations are spotted they must be evaluated. Technically trained entomologists must go into those considered important and look them over. Before they can decide upon control needs they must determine the insect species involved, the area infested, the possibilities of danger if left uncontrolled, whether or not the infestation is on the upgrade or downgrade, the type of control measures adaptable, and when and how to apply them. They must be continuously aware of newer control methods, newer insecticides, and newer information on life history, habits, and natural control factors. They must be working hand-in-glove with those conducting research to do the best job. In fact, research and surveys are too closely interwoven to say where one leaves off and the

other begins. As we proceed with this survey program, as the coverage of forested areas increases, and as timber supplies become more and more scarce and, therefore, more valuable, we are bound to run into insect species that must be added to the list of injurious pests. These must be studied. Research and surveys, therefore, must move along together, the give and take of information between them must be continuous if we are to obtain the maximum benefit from efforts to prevent or suppress injurious infestations.

Insects do not recognize forest values--they attack anywhere conditions are favorable. In some areas or stands it is not economically sound to control them, in others the reverse is true. Which of the many infestations reported each year warrants control is a problem. In order that control funds may be used to greatest advantage, organizations of timber owners and land-managing agencies are being formed to assist in reviewing the needs for control work in many areas. Also efforts are being made to organize what may be called a National Advisory Board which would consider the over-all picture for the same purpose. The advice and assistance of these organizations are welcome and such a relationship suggests realization of the maximum benefit from control efforts.

Insects not only ignore forest values, they also ignore ownership barriers; and this can be embarrassing in conducting control operations in states which do not have legislation requiring owner participation.

Too often it is not entomologically sound to do a partial control job. The Bureau at present is analyzing existing legislation in states having such laws with the idea of furnishing worthwhile information on the subject to other interested states.

Research, survey, and control. These three compose forest entomology. The safety of the valuable forest resources from needless destruction by insects lies in their retention as a team, each making use of, and contributing to the success of the other.